

**Economic Analysis
Klamath Basin National Wildlife Refuge Complex
Comprehensive Conservation Plan**

Division of Economics
U.S. Fish and Wildlife Service

Assistance from:

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and
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Introduction

The Klamath Basin National Wildlife Refuge Complex (NWRC) consists of six national wildlife refuges (NWRs) located in northern California and southern Oregon. Five of the six NWRs, including Lower Klamath, Clear Lake, Tule Lake, Bear Valley, and Upper Klamath, are the focus of this economic analysis and span three contiguous counties, including Siskiyou and Modoc Counties in northern California and Klamath County in southern Oregon. This three-county area is hereafter referred to as the study area for this economic analysis.

The analysis describes the current contribution to the economy of the five refuges and then details potential effects on economy resulting from implementing alternative CCP management actions that are part of a Comprehensive Conservation Plan (CCP) being developed by the U.S. Fish and Wildlife Service (Service). The CCP provides a description of the desired future conditions and long-range guidance to accomplish the purposes for which the refuges were established. The CCP and accompanying Environmental Impact Statement (EIS) address Service legal mandates, policies, goals, and National Environmental Policy Act (NEPA) compliance. This economic analysis was conducted to assist the Service with completing the CCP/EIS document for the five refuges in accordance with NEPA.

Economic impacts addressed in this analysis include those associated with budget expenditures and public use of the refuges, and agricultural production on some refuge lands. The refuge administration budgets were apportioned from the overall Klamath Basin NWRC according to historical and expected use or resources. Expenditures associated with managing a sixth refuge (the Klamath Marsh NWR) are not analyzed in this study. No economic benefits or effects are expected on the Klamath Marsh NWR from implementing any of the alternatives herein.

Methodology

The Service is evaluating several alternatives for managing the five Klamath Basin NWRC refuges that are included in this analysis. (The number of alternatives varies for each refuge.) Additionally the alternatives within each refuge are independent. For example Clear Lake NWR could choose Alternative A (No Action) while Bear Lake NWR could implement Alternative B. Each alternative includes numerous management actions, including actions potentially affecting water quality management, wetland habitat management, agricultural habitat management, hunting and other visitor resources, land acquisition priorities, and changes in the management of other refuge resources.

As part of this analysis, regional economic conditions in the study area are described, including the contribution to the economy that current operations of the five refuges make. These characterizations were derived using current refuge conditions including operations data as informational input to the IMPLAN input-output model (Minnesota IMPLAN Group, Inc. 2010 and 2013). The effects of implementing each of the CCP management alternatives on regional economic conditions are described. For this analysis regional effects are limited to the study area of the three counties which the refuges reside in: Siskiyou, Klamath, and Modoc counties. These effects could be caused by potential changes in NWRC administration, potential changes in levels of NWRC wildlife-dependent visitation, and potential changes in agricultural production on NWRC lands. Instead of having a small set of thematic alternatives; the analysis brackets from lowest to highest the possible effects of a large number of combinations.

These potential effects were identified through collaboration with NWRC staff (Griggs pers. comm.). Note that Alternative A (the No Action Alternative) serves as a baseline condition for the analyses; consequently, implementation of Alternative A, which proposes continuation of current management program at all refuges, would result in the economic situation described below under existing conditions.

Regional Economic Conditions

The Klamath Basin NWRC study area is in a rural area with few nearby communities. Klamath Falls, Oregon, is the largest city near the refuge complex, with an estimated 2010 population of more than 20,000 (U.S. Census Bureau 2010). Among study area communities, Klamath Falls provides the greatest array of amenities (e.g., hotels, restaurants, retail stores) for visitors to the area. Some of the smaller communities in the study area, such as Tulelake and Dorris, also provide visitor amenities, such as motels, restaurants, and gas stations. Tulelake is a town of 1,010 residents located on State Route 139 in California, just east of the Tule Lake and Lower Klamath refuges and west of Clear Lake Refuge. The town of Dorris, located in California along U.S. 97 west of Lower Klamath Refuge, had an estimated population of 939 in 2010. Communities in Oregon near the NWRC include Chiloquin (population 734 in 2010), located east of the Upper Klamath Refuge; Merrill (population 844 in 2010), located north of Tule Lake and Lower Klamath Refuges; and Malin (population 805 in 2010), located east of Merrill.

Refuge operations contribute to levels of industry output, employment, and personal income in the study area. The sectors of the study area's economy that most benefit from refuge operations include the agricultural sector, the federal government sector, and various related sectors that collectively comprise the recreation and tourist-servicing industry, including food and beverage stores, gasoline stations, miscellaneous retailers, hotels and motels, and food services and drinking places. Industry output represents the dollar value of an industry's total production. Value of production is usually measured as the market value of goods and services sold by an industry. Employment is the number of jobs in each industry, including both full- and part-time workers and self-employed individuals. Personal income mostly consists of the wages, salaries, and value of benefits of the affected work force.

Economic activity of the directly-affected sectors also indirectly affects economic conditions in other sectors of the study area's economy as spending in the directly affected businesses and the government, and its employees, ripple through the study area economy. For this analysis, economic conditions in the study area are characterized by levels of industry output (value of total production), jobs, and personal income in 2010.

As shown in Table 1, economic output in the study area totaled about \$6.8 billion in 2010, with Oregon's Klamath County generating the largest shares of output, followed by Siskiyou and Modoc counties in California. Considered together, the three major sectors most sensitive to refuge management and operations - agriculture, recreation and tourist servicing, and federal government - accounted for about 24 percent of total industry output in the study area in 2010.

**Table 1. Total Economic Output^a by Industry in Study Area Counties 2010
(Millions of 2015 Dollars)**

County	Industry Category								
	Agriculture ^a	Food & Beverage Stores	Gasoline Stations	Miscellaneous Retailers ^b	Hotels & Motels ^c	Food Services & Drinking Places	Federal Government ^d	All Other Sectors	Total ^e
Klamath (OR)	237	38	21	181	32	103	73	2,818	3,502
Modoc (CA)	161	6	7	15	1	8	37	322	557
Siskiyou (CA)	304	30	44	90	38	77	96	2,053	2,734
TOTAL ^e	702	74	72	287	71	189	206	5,194	6,794

Source: Minnesota IMPLAN Group 2010 base data, ran in 2012.

Notes:

^a Includes crop, cattle and livestock, dairy, milk production, poultry and egg production, nursery and floriculture production, and agricultural and forestry support services sectors.

^b Includes retailers, excluding food and beverage stores and gasoline stations.

^c Also includes other types of accommodations.

^d Excludes federal enterprises and military and U.S. Postal Service sectors.

^e Totals may differ from the summation of components due to rounding.

The number of jobs and levels of personal income are key indicators of the importance of these sectors to the study area economy. As derived from data in Tables 2 and 3, the three major sectors considered most sensitive to refuge management (agriculture, federal government, and various sectors that collectively comprise the recreation and tourist-servicing industry) accounted for about 28 percent of the jobs and 24 percent of the personal income in the study area in 2010. Agriculture accounted for about 7 percent of total employment and 3 percent of personal income in the study area, with Klamath and Siskiyou counties accounting for most of the agricultural employment and income. Federal government employment generated about 3 percent of study area employment, but nearly 10 percent the area's employee compensation in 2010, with Siskiyou County accounting for the largest share. The sectors comprising the recreation and tourist-servicing industry - including food and beverage stores, gasoline stations, retail businesses, hotels and motels, and food services and drinking establishments - accounted for about 18 percent of study area-wide employment and 11 percent of personal income, with more than half of the retail employment and income located in Klamath County.

Estimates of the contribution that the five refuges make to the three-county study area (which represent the regional economy) are identified below in the Contribution to the Regional Economy of Existing NWRC Operations, Refuge Visitor-Related Spending, and Agricultural Production on NWRC Lands section.

Table 2. Total Employment^a by Industry in Study Area Counties, 2010

County	Industry Category								Total ^f
	Agriculture ^b	Food & Beverage Stores	Gasoline Stations	Miscellaneous Retailers ^c	Hotels & Motels ^d	Food Services & Drinking Places	Federal Government ^e	All Other Sectors	
Klamath (OR)	1,842	625	276	2,905	369	1,844	696	23,675	32,232
Modoc (CA)	679	96	32	223	9	154	359	2,906	4,458
Siskiyou (CA)	1,550	470	268	1,304	398	1,307	946	15,235	21,478
TOTAL^f	4,071	1,191	576	4,432	776	3,305	2,001	41,816	58,168

Source: Minnesota IMPLAN Group 2010 base data, ran in 2012.

Notes:

^a Includes full- and part-time jobs.

^b Includes crop, cattle and livestock, dairy, milk production, poultry and egg production, nursery and floriculture production, and agricultural and forestry support services sectors.

^c Includes retailers, excluding food and beverage stores and gasoline stations.

^d Also includes other types of accommodations.

^e Excludes federal enterprises and military and U.S. Postal Service sectors.

^f Totals may differ from the summation of components due to rounding.

**Table 3. Total Personal Income Compensation^a by Industry in Study Area Counties 2010
(Millions of 2015 Dollars)**

County	Industry Category								
	Agriculture ^b	Food & Beverage Stores	Gasoline Stations	Miscellaneous Retail ^c	Hotels & Motels ^d	Food Services & Drinking Places	Federal Government ^e	All Other Sectors	Total ^f
Klamath (OR)	25.3	17.2	6.5	67.4	7.4	30.3	65.6	860.5	1080.2
Modoc (CA)	11.2	2.2	0.1	5.1	0.1	2.0	32.4	86.9	140.0
Siskiyou (CA)	20.0	12.9	6.1	29.0	6.6	20.0	84.7	504.1	683.5
TOTAL ^f	56.5	32.3	12.7	101.5	14.1	52.3	182.7	1451.6	1903.7

Source: Minnesota IMPLAN Group 2010 base data, ran in 2012.

Notes:

^a Includes wages, salary, and value of benefits of employees (employee compensation); excludes proprietary income and other property-type income.

^b Includes crop, cattle and livestock, dairy, milk production, poultry and egg production, nursery and floriculture production, and agricultural and forestry support services sectors.

^c Includes retailers, excluding food and beverage stores and gasoline stations.

^d Also includes other types of accommodations.

^e Excludes federal enterprises and military and U.S. Postal Service sectors.

^f Totals may differ from the summation of components due to rounding.

Current Klamath Basin NWRC Operations and Related Economic Activities

On an ongoing basis, the Klamath Basin NWRC contributes to the local economy through expenditures made by the federal government to manage, operate, and maintain the five wildlife refuges; by the local spending of visitors to the refuges; and by the production of commercial crops on refuge lands. Together, the five wildlife refuges consist of about 156,000 acres.

Lower Klamath Refuge, partially located in both Oregon's Klamath County and California's Siskiyou County, was established as the nation's first waterfowl refuge in 1908 by President Theodore Roosevelt because of its tremendous wildlife resources. Its size was reduced by subsequent executive orders and later increased by the 1964 Kuchel Act and new land acquisitions. The combined area of Lower Klamath Refuge, the Kuchel Act tracts, and the new acquisitions is 51,247 acres,

Clear Lake Refuge was established in 1911 as a "preserve and breeding ground for native birds" (Executive Order 1332). Clear Lake Refuge is located in northern California, just south of the Oregon border in Modoc County. The refuge encompasses approximately 46,460 acres, including the 20,000-acre Clear Lake Reservoir and 26,000 acres of upland habitat. Clear Lake Reservoir is a component of the Klamath Project and is the primary water source for agricultural lands in the eastern half of the Klamath Basin. No croplands, however, are located within Clear Lake Refuge.

Tule Lake Refuge is located in extreme northern California in Modoc and Siskiyou counties, approximately 6 miles west of the town of Tule lake, California. The refuge was established by President Calvin Coolidge on October 4, 1928 via Executive Order Number 4975 and was amended by two subsequent Executive Orders (Number 5945 dated November 4, 1928, and Number 7341 dated April 10, 1936). The Executive Order language states that the lands are to be managed "... as a Refuge and breeding ground for wild birds and animals." Tule Lake Refuge is home to the refuge complex headquarters and visitor center. The refuge consists of 39,116 acres, including two open water sumps (reservoirs totaling 13,000 acres) surrounded by approximately 17,000 acres of cropland.

Upper Klamath Refuge was established in 1928 as a preserve and breeding ground for wild birds and animals. It is comprised of approximately 23,000 acres of mostly freshwater marsh and open water with approximately 30 acres of forested uplands. Upper Klamath Refuge is located in Klamath County, Oregon, approximately 35 miles north of the California border. It consists of three units: Hanks Marsh at the south end of Upper Klamath Lake, Upper Klamath Marsh at the north end, and the more recently acquired Agency/Barnes unit. Upper Klamath Lake is adjacent to the east boundary of the Refuge. No croplands are located within the Upper Klamath Refuge boundary.

Bear Valley Refuge, located in Klamath County just north of the California border, was established in 1978 to protect a major night roost site for wintering bald eagles. The Refuge consists of 4,200 acres, primarily of old growth ponderosa pine, incense cedar, and white and Douglas fir. No croplands are included within the refuge.

NWRC Administration

Klamath Basin NWRC facilities include shops, vehicle storage, offices, residences, fueling stations, pump houses, hazardous material storage, visitor centers, and wildlife rehabilitation buildings. These facilities support refuge maintenance and management activities and operations, as well as visitor services. The NWRC administrative headquarters and visitor center are located at the northwest corner of Tule Lake Refuge, near the community of Tulelake in Siskiyou County. Most of the heavy equipment and other refuge equipment and vehicles are parked in common areas at Tule Lake and Lower Klamath refuges. Routine maintenance activities of refuge equipment occur in these areas.

During the last (2014-15) fiscal year, the Service spent \$3,939,570 to operate and maintain the five refuges, including \$3,040,767 for salaries, and \$898,803 for all other expenses. As part of base budget expenditures, the Service spends about three million dollars on salaries, employing 27 employees who assist with management, operations, and maintenance of the five refuges being analyzed in the Klamath Basin NWRC and its programs. According to the Service, all of the employees reside in the study area, with most of the administrative staff presumably living near the administration/operations headquarters near the community of Tulelake (Siskiyou County). Although not presented in Table 4, base goods and services expenditures across the three budgets generally fall into the following categories: utilities (25 percent), fuel (23 percent), vehicle and equipment replacement (20 percent), vehicle repair (18 percent), parts and building materials (9 percent), and office supplies (5 percent) (Barry pers. comm. 2013).

Table 4. Fiscal Year 2014-15 Budget Expenditures and Data for the Klamath Basin National Wildlife Refuge Complex (2015 Dollars)

Category	Lower Klamath NWR	Clear Lake NWR	Tule Lake NWR	Bear Valley NWR	Upper Klamath NWR	Five Refuge Total
Salary Expenditures	\$1,364,508	\$303,224	\$1,061,284	\$151,612	\$160,138	\$3,040,767
All Other Expenditures	\$404,461	\$89,880	\$314,581	\$44,940	\$44,940	\$898,803
Total Budget	\$1,768,970	\$393,104	\$1,375,865	\$196,552	\$205,078	\$3,939,570
RSS Transfers ^a	\$11,961	\$8,105	\$19	\$6,417	\$19,951	\$46,452
Kuchel Act Payment ^b	\$10,556	-	\$502,244	-	-	\$512,800
Number of Jobs	-	-	-	-	-	27

Source: Griggs pers. comm.

Notes:

^aRSS transfer data is from 2014 and indexed to 2015 dollars.

^bKuchel Act payments in lieu of taxes (PILT).

Recreational Visitor Use

Public use occurs at all five affected complex refuges. Public use opportunities at the study area's five NWRC refuges are summarized as follows.

- Lower Klamath Refuge: The Service maintains photo and hunting blinds, a wildlife overlook, a 10-mile auto tour route with signs, and vehicle pull-offs. The refuge offers a mix of marsh hunting for both boat and walk-in hunters, and field hunting for geese and pheasant in both grain stubble and areas of standing grain.
- Clear Lake Refuge: Except for waterfowl hunting and a limited antelope hunt, the refuge is closed to all public entry. No facilities are located within the refuge. Parking for walk-in hunting access is available along roads leading to the refuge. The area is not heavily hunted, probably due to the limited, difficult access. Wildlife viewing is possible from a road along the southern edge of the refuge.
- Tule Lake Refuge: Recreation opportunities on the refuge include the visitor center, wildlife viewing areas, a wildlife auto route, waterfowl and pheasant hunting, photography blinds, and a canoe trail. The hunt areas include waterfowl- and pheasant-only areas and joint waterfowl/pheasant areas. The auto tour and interpretive areas around the visitor center are open to the public year round. The canoe trail is open seasonally.
- Upper Klamath Refuge: The refuge offers waterfowl hunting, fishing, wildlife observation and photography, environmental education, and interpretation. Access to the refuge, however, is primarily by boat because of the presence of flooded wetlands most of the year. Additionally, walk-in hunting access is available for hunters who park off-site in nearby areas. No facilities are located within the refuge, but a canoe trail with signs through the wetlands provides wildlife observation opportunities.
- Bear Valley Refuge: The refuge was established, in part, to protect roosting bald eagles from human disturbance. Accordingly, the Refuge is closed to all public entry, except for walk-in deer hunting before November 1. From December through mid-March, the refuge offers excellent opportunities to observe fly-outs of large numbers of bald eagles from their night roost from an observation site off U.S. Route 97.

For purposes of this economic analysis 2015 data for visitors by type of activity to each of the refuges, as reported by Kenneth Griggs the Deputy Project Leader, were used in the calculations. The Lower Klamath NWR recreation is dependent on water deliveries therefore the data is displayed as expected values¹. The 2015 data is as follows:

¹ The visitor use information was generated by Stacy Freitas, Wildlife Refuge Specialist, and Ken Griggs, Deputy Project Leader, at Klamath Basin NWRC. Both hunter and non-consumptive user (wildlife photography, observation, etc.) numbers were generated using count data and staff observations and estimation. A hunt check station on Tule Lake NWR, where hunters are assigned fields and blinds was used to provide actual count data on hunter uses of portions of TLNWR. However, many hunters in other portions of TLNWR, LKNWR, UKNWR,

- Lower Klamath NWR: 8,000 to 16,000 hunting visits, and 27,300 to 35,800 wildlife viewing and non-consumptive visits
- Clear Lake NWR: 75 hunting visits
- Tule Lake NWR: 13,750 hunting visits, and 40,300 wildlife viewing and non-consumptive visits
- Upper Klamath NWR: 4,000 hunting visits, 10,000 wildlife viewing visits, and 5,000 fishing visits
- Bear Valley NWR: 280 hunting visits

Note that these values represent the numbers of 8-hour visits to each refuge, which were derived by converting estimates of the number of people recreating and average hours per visit.

Based on spending profiles for local (within 50 miles) and non-local residents who visited the Klamath Basin NWRC, as reported in the U.S. Fish and Wildlife's 2006 National Survey of Fishing, Hunting and Wildlife Related Recreation, total visitor-related expenditures made within the three-county study area were estimated. Annual spending in the study area by visitors to the Klamath Basin NWRC is estimated at \$4,225,000 (2015 dollars). Of this total, spending in food and drink establishments and for transportation (excluding air transport) each accounted for about 31 percent of total spending, and lodging expenditures accounted for about 24 percent. Non-local visitors accounted for an estimated 63 percent of total visitor-related spending within the study area. See **Table 18. Summary of Recreation by Refuge and Alternative: Visitation Data** for additional details.

Agricultural Production on NWRC Lands

Of the Klamath Basin NWRC's five refuges in this study four of them have agricultural production, only Bear Valley NWR does not. On the Lower Klamath and Tule Lake Refuges, properties are farmed under both a lease land program and a cooperative farming program. While the lease lands are under the administrative jurisdiction of the Klamath Basin Refuges, the U.S. Bureau of Reclamation (Reclamation) administers the agricultural leasing program via a Cooperative Agreement. The Service manages the cooperative farming on the refuges.

The lease and program is operated under the auspices of the Kuchel Act (Public Law 88-567), passed by Congress in 1964. The Act was intended to ensure that certain refuge habitats are preserved for migratory waterfowl while allowing continued agricultural practices consistent with waterfowl conservation. Leases are awarded in five-year increments with the option to renew each year. Approximately 20 percent of the leases are put out for bid each year with the remaining available for renewal. Although up to 25 percent of lease land areas may be planted to row crops, the lease lands at Tule Lake Refuges are currently used by local growers for the commercial production of conventional and organic alfalfa, grass hay, potato, onion,

CLNWR, and BVNWR, are not required to go through a check station. In these instances, daily observation by biological and visitor services staff was used to estimate numbers of individuals per day. This was extrapolated to a 100 day season in the case of waterfowl hunting.

Count data of visitors using the Complex Visitor Center was used to partially estimate the number of visitors enjoying wildlife photography and wildlife observation. Again, not all visitors come into the visitor center, so observation and estimation were employed to generate the numbers provided.

horseradish, and small grains, and for livestock grazing. On Lower Klamath Refuge, lease land farming is limited to grains and pasture as well as haying and grazing. Row crops are not allowed on Lower Klamath Refuge. Approximately 5,600 acres of land on the Lower Klamath Refuge and 14,900 acres of land on the Tule Lake Refuge were leased and farmed in accordance with the Kuchel Act in 2015 (Pelz pers. comm.). The Lease Land program has generated an average of \$3.6 million annually in lease revenue from 2006 through 2015. The net revenue from the leasing program is split between the Tulelake Irrigation District, the counties (Siskiyou, Klamath, and Modoc counties), and the Bureau of Reclamation (Green 2016). The Bureau of Reclamation received an annual average of \$2.0 million a year during the same period and is not obligated to use this revenue for habitat enhancement work on the refuges. The average payments to the counties which were designed to compensate for losses in property taxes totaled \$375 thousand a year. The Service currently receives no direct revenues from the program.

Acreage farmed on the two refuges under the Cooperative Farmland program are dedicated exclusively to cereal grain (usually barley) production on the Lower Klamath Refuge and grains, potatoes, and onions on the Tule Lake Refuge. The farmer is allowed to harvest three-quarters of the crop in consideration of his expense and labor for tilling, seeding, and fertilizing the crop. The one-fourth that the farmer is not allowed to harvest is left standing in the field for the benefit of wildlife. The farmer provides all seed, fertilizer, pesticide, equipment, fuel, and labor while the Service provides the land, water, and irrigation services. Approximately 2,400 acres of land on the Tule Lake Refuge, and 4,500 to 5,000 acres of land on the Lower Klamath Refuge, were cooperatively farmed in 2011 through 2015 (Barry pers. comm.).

Combining both programs, farmed areas in the two refuges totaled approximately 27,900 acres in 2014, including 10,000 acres within the Lower Klamath Refuge and 16,000 in the Tule Lake Refuge (Table 5). Based on the average yields and prices shown in Table 6, the value of production on harvested acreage totaled an estimated \$30.0 million in that year, including approximately \$5.6 million on Lower Klamath Refuge properties and \$24.4 million on Tule Lake Refuge properties. Table 7 details crop production followed by Table 8 detailing the productivity of cattle grazing within the NWRC.

**Table 5. Agriculture - Cattle: Grazing Productivity
(2015 Dollars)**

Unit (Scenario)	Acres	Cows	Cows Per Acre	Sale Price per Cow	Average Sales per Acre
Lower Klamath NWR	11,225	3,600	0.32	\$1,095	\$351
Upper Klamath NWR (Low)	1,400	560	0.40	\$1,095	\$438
Upper Klamath NWR (High)	2,200	560	0.25	\$1,095	\$279
Clear Lake NWR	5,500	600	0.11	\$1,095	\$119
Tule Lake NWR ^c	-	-	-	-	-
Bear Valley NWR ^c	-	-	-	-	-
Total (Low)	18,125	4,760	0.26	-	-
Total (High)	18,925	4,760	0.25	-	-

Notes:

^aCow price is \$1,095 (USDA NASS 2012).

^bAcres for productivity calculations may not match acres in alternative 1 (No Action).

^cNo grazing exists on the Tule Lake NWR and the Bear Valley NWR under the No Action Alternative.

**Table 6. Agriculture - Crops: Productivity
(2015 Dollars)**

Category	Crops	Yield per Acre	Value per Unit	Average Group Yield per Acre	Average Group Value per Unit	Average Sales per Acre
Alfalfa	Alfalfa (ton)	5.25	\$186	5.25	\$186	\$976
Grains	Barley (ton)	2.75	\$222	2.6175	\$238	\$623
	Oats (ton)	2.47	\$261			
	Rye (ton)	1.95	\$214			
	Wheat (ton)	3.3	\$255			
Hay	Hay (ton)	4.1	\$148	4.1	\$148	\$606
Row Crops	Onions (cwt)	503	\$6.84	508	\$7.88	\$4,003
	Potatoes (cwt)	513	\$8.92			

Notes:

^a Represents average yield per acre in Siskiyou County from 2007-2011, as reported in annual Siskiyou County crop and livestock reports.

^b Represents average gross value of production per unit from 2007-2011, as reported in annual Siskiyou County crop and livestock reports.

**Table 7. Crop Production - Acres and Sales
(2015 Dollars)**

Area & Scenario	Acres Total		Row Crops	Sales Row Crops	Alfalfa	Sales Alfalfa	Haying	Sales Haying	Total Acres in Production for	
	Grain (sold)	Sales Grain							Sales	Total Sales
Lower Klamath NWR - Alt A (.2)	1,200	\$747,558	0	\$0	0	\$0	2,000	\$1,211,948	3,200	\$1,959,506
Lower Klamath NWR - Alt A (.8)	7,200	\$4,485,348	0	\$0	0	\$0	2,000	\$1,211,948	9,200	\$5,697,296
Lower Klamath NWR - Alt A KBRA (.2)	3,700	\$2,304,971	0	\$0	0	\$0	2,000	\$1,211,948	5,700	\$3,516,919
Lower Klamath NWR - Alt A KBRA (.8)	7,200	\$4,485,348	0	\$0	0	\$0	2,000	\$1,211,948	9,200	\$5,697,296
Tule Lake NWR- Alt A	10,990	\$6,846,136	6,374	\$25,515,377	1,936	\$1,888,827	0	\$0	19,300	\$34,250,340
Upper Klamath NWR - Alt A	0	\$0	0	\$0	0	\$0	200	\$121,195	200	\$121,195
<i>Total Minimum</i>	<i>12,190</i>	<i>\$7,593,694</i>	<i>6,374</i>	<i>\$25,515,377</i>	<i>1,936</i>	<i>\$1,888,827</i>	<i>2,200</i>	<i>\$1,333,143</i>	<i>22,700</i>	<i>\$36,331,041</i>
<i>Total Maximum</i>	<i>18,190</i>	<i>\$11,331,484</i>	<i>6,374</i>	<i>\$25,515,377</i>	<i>1,936</i>	<i>\$1,888,827</i>	<i>2,200</i>	<i>\$1,333,143</i>	<i>28,700</i>	<i>\$40,068,831</i>

Source: Barry pers. comm.

**Table 8. Agriculture - Cattle: Acres and Sales
(2015 Dollars)**

Unit (Scenario)	Acres	Cows Per Acre	Cows	Sale Price per Cow	Average Sales per Acre	Sales
Lower Klamath NWR ^a	12,500	0.32	4,000	\$1,095	\$350	\$4,380,000
Upper Klamath NWR (Low)	1,400	0.4	560	\$1,095	\$438	\$613,200
Upper Klamath NWR (High)	2,200	0.25	560 ^a	\$1,095	\$274	\$613,200
Clear Lake NWR	5,000	0.11	550	\$1,095	\$120	\$602,250

Notes:

^aAUMs in Upper Klamath NWR are not variable. The number of acres the cows can occupy is.

^aFor all water delivery schedules

Economic Impact of Existing Conditions

Existing activities occurring on the NWRC provide regional economic benefits to businesses and households throughout the study area, but mostly for those communities near the actively managed refuge lands, particularly Tule Lake, where the NWRC is headquartered. As described above, these activities include NWRC administration that generates salaries and procures goods and services needed for refuge management, visitors recreating at the refuges who also spend in the local economy, and agricultural production on NWRC lands.

NWRC Administration

Based on modeling results from the IMPLAN input-output model, current NWRC administration is estimated to directly and indirectly support about 31 jobs in the study area (Table 9). Of these jobs, an estimated 21 are federal employees directly engaged in NWRC management on these five refuges, operations and maintenance activities. The remaining 9 jobs are indirectly generated by the local procurement of goods and services needed for NWRC operations and by the spending of employees directly and indirectly supported by NWRC activities. Estimated personal income and industry output directly and indirectly generated in the study area by existing NWRC administration totaled about \$1.8 million and \$4.0 million, respectively (in 2015 dollars) (Table 9).

Table 9. Economic Benefits of Current NWRC Administration

Category	Lower Klamath NWR	Clear Lake NWR	Tule Lake NWR	Bear Valley NWR	Upper Klamath NWR	Five Refuge Total
Salary Expenditures	\$1,364,508	\$303,224	\$1,061,284	\$151,612	\$160,138	\$3,040,767
Salary Expenditures Less Benefits (used for calculations)	\$955,156	\$212,257	\$742,899	\$106,128	\$112,097	\$2,128,537
Output	\$1,367,783	\$303,952	\$1,063,832	\$151,976	\$160,522	\$3,048,065
Employment Compensation	\$683,892	\$151,976	\$531,916	\$75,988	\$80,261	\$1,524,032
Jobs	9.6	2.1	7.4	1.1	1.1	21.3
All Other Expenditures^a	\$404,461	\$89,880	\$314,581	\$44,940	\$44,940	\$898,803
Output	\$410,303	\$91,178	\$319,125	\$45,589	\$45,589	\$911,785
Employment Compensation	\$102,839	\$22,853	\$79,986	\$11,427	\$11,427	\$228,532
Jobs	4.0	0.9	3.1	0.4	0.4	8.8
Total Budget	\$1,768,970	\$393,104	\$1,375,865	\$196,552	\$205,078	\$3,939,570
Output	\$1,778,086	\$395,130	\$1,382,956	\$197,565	\$206,112	\$3,959,850
Employment Compensation	\$786,731	\$174,829	\$611,902	\$87,415	\$91,688	\$1,752,565
Jobs	13.5	3.0	10.5	1.5	1.6	30.1

Source: IMPLAN input-output model run results, based on NWRC budget information provided by Griggs pers. comm.

Notes:

Effects include direct and secondary (indirect and induced) effects of existing average annual expenditures for refuge management.

Employment (jobs) includes full- and part-time jobs.

^a65% of All Other Expenditures are local and used for the IMPLAN runs.

Recreational Visitor Use

Based on IMPLAN modeling results, annual spending by public visitors to the NWRC supports an estimated 31 jobs in the study area economy and generates about \$775,000 (in 2015 dollars) annually in personal income (see **Table 19 Summary of Recreation by Refuge and Alternative: Expenditures and Economic Impacts** for full impact details). Additionally, visitor-related spending generated an estimated \$3.6 million in industry output in the study area.

Agricultural Production on NWRC Lands

The production of crops on the NWRC properties are estimated to support about 589 to 659 jobs and \$12.7 to 14.5 million in personal income in the study area, based on IMPLAN modeling results (Table 10). Industry output attributable to agricultural production on NWRC properties totals an estimated \$59.9 to \$66.5 million. Local cattle grazing productivity data is displayed in Table 11. Cattle grazing supports 43 jobs and \$722,000 in personal income with an economic output of \$8.7 million (Table 12).

**Table 10. Economic Benefits of Existing Agricultural Crop Production
(2015 Dollars)**

Area & Scenario	Grain Output	Grain Employment Compensation	Grain Jobs	Row Crops Output	Row Crops Employment Compensation	Row Crops Jobs	Hay & Alfalfa Output	Hay & Alfalfa Employment Compensation	Hay & Alfalfa Jobs	Total Output	Total Employment Compensation	Total Jobs
Lower Klamath NWR - Alt A (.2)	1,320,249	177,490	7.0	0	0	0.0	2,140,400	177,490	7.0	\$3,460,648	\$354,981	14.0
Lower Klamath NWR - Alt A (.8)	7,921,492	1,064,942	42.0	0	0	0.0	2,140,400	1,064,942	42.0	\$10,061,892	\$2,129,885	83.9
Lower Klamath NWR - Alt A KBRA (.2)	4,070,767	547,262	21.6	0	0	0.0	2,140,400	547,262	21.6	\$6,211,166	\$1,094,524	43.1
Lower Klamath NWR - Alt A KBRA (.8)	7,921,492	1,064,942	42.0	0	0	0.0	2,140,400	1,064,942	42.0	\$10,061,892	\$2,129,885	83.9
Tule Lake NWR- Alt A	12,090,837	1,625,457	64.1	40,808,837	9,118,266	446.7	3,335,822	1,625,457	64.1	\$56,235,496	\$12,369,179	574.8
Upper Klamath NWR - Alt A	0	0	0.0	0	0	0.0	214,040	0	0.0	\$214,040	\$0	0.0
Clear Lake NWR - Alt A	0	0	0.0	0	0	0.0	0	0	0.0	\$0	\$0	0.0
Bear Valley NWR - Alt A	0	0	0.0	0	0	0.0	0	0	0.0	\$0	\$0	0.0
<i>Total Minimum</i>	<i>13,411,086</i>	<i>\$1,802,947</i>	<i>71</i>	<i>\$40,808,837</i>	<i>9,118,266</i>	<i>\$447</i>	<i>5,690,262</i>	<i>\$1,802,947</i>	<i>71</i>	<i>\$59,910,184</i>	<i>\$12,724,160</i>	<i>588.8</i>
<i>Total Maximum</i>	<i>20,012,329</i>	<i>\$2,690,399</i>	<i>106</i>	<i>\$40,808,837</i>	<i>9,118,266</i>	<i>\$447</i>	<i>5,690,262</i>	<i>\$2,690,399</i>	<i>106</i>	<i>\$66,511,428</i>	<i>\$14,499,064</i>	<i>658.8</i>

Source: IMPLAN input-output model run results, based on the estimated value of agricultural production on NWRC properties in 2015 (Table 5).

Notes:

Effects include direct and secondary (indirect and induced) effects.

^a Employment includes full- and part-time jobs.

Table 11. Cattle: Grazing Productivity

Unit (Scenario)	Acres	Cows	Cows Per Acre	Sale Price per Cow	Average Sales per Acre	Sales
Clear Lake NWR (Alternative A)	5,500	600	0.1	\$1,095	\$119	\$657,000
Clear Lake NWR (Alternative B increase, Low)	3,000	300	0.1	\$1,095	\$110	\$328,500
Clear Lake NWR (Alternative B increase, High)	3,000	500	0.2	\$1,095	\$183	\$547,500

Source: Smith pers. Comm. 2016

Notes:

Numbers are rounded.

**Table 12. Economic Benefits of Existing Cattle Production
(2015 Dollars)**

Area	Sales	Output	Employment Compensation	Jobs
Lower Klamath NWR	\$4,380,000	\$7,269,804	\$606,949	36.2
Upper Klamath NWR	\$613,200	\$1,017,772	\$84,973	5.1
Clear Lake NWR	\$602,250	\$999,598	\$83,456	5.0
Total	\$5,212,200	\$8,651,066	\$722,270	43.1

Economic Impacts of the NWRC Management Alternatives

This report section identifies potential economic impacts of the management alternatives proposed for each of the five refuges. From the perspective of economic impacts, alternative management actions would be expected to have differing (and, in some cases, offsetting) effects on governmental spending for NWRC operations and management, on the amount of spending by visitors to the NWRC, and on agricultural production activity. The effects of refuge-related activities would, in turn, affect levels of industrial output, employment, and personal income within the three-county study area. As previously noted, the effects described below represent expected changes from current conditions (Alternative A, the No Action Alternative).

Lower Klamath NWR

Alternative B

Under Alternative B, implementation of management activities in the Lower Klamath NWR could result in:

- a short-term increase in refuge spending and local economic activity due to construction or modification of facilities (Table 13);
- a minor increase in overall refuge operations spending and related local economic impacts due to increased staffing (Table 13);
- a moderate increase in visitation, visitor spending, and related local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation; and
- a decrease in farming production and related local economic impacts due to shifts from grain to irrigated pasture compared to Alternative A (Table 20 – Table 23).

Alternative C

Under Alternative C, implementation of management activities in the Lower Klamath NWR could result in:

- a short-term increase in refuge spending and local economic activity due to construction or modification of facilities (Table 13);
- a minor increase in overall refuge operations spending and related local economic impacts due to increased staffing (Table 13);
- a moderate increase in visitation, visitor spending, and local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation; and
- a decrease in farming production and related local economic impacts due to shifts from grain to irrigated pasture compared to Alternative A (Table 20 and Table 22).

- an increase in cattle production and related local economic impacts due to increases in area grazed compared to Alternative A (Table 21 and Table 23).

Alternative D

Under Alternative D, implementation of management activities in the Lower Klamath NWR could result in:

- a large short-term increase in refuge spending and local economic activity due to construction or modification of facilities associated with the Big Pond unit (Table 13);
- a minor increase in overall refuge operations spending and related local economic impacts due to increased staffing (Table 13);
- a moderate increase in visitation, visitor spending, and local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation; and
- a decrease in farming production and related local economic impacts due to shifts from grain to irrigated pasture compared to Alternative A (Table 20 and Table 22).
- an increase in cattle production and related local economic impacts due to increases in grazing compared to Alternative A (Table 21 and Table 23).

Clear Lake NWR

Alternative B

Under Alternative B, implementation of management activities in the Clear Lake NWR could result in:

- a one-time increase in refuge spending and local economic activity due to public facility improvements (Table 14);
- little to no net change in overall refuge operations spending, thereby resulting in operations spending levels and related local economic impacts that would be similar to those for Alternative A (Table 14);
- a minor increase in visitation, visitor spending, and local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation; and
- an increase in agricultural production due more grazing acres being made available (Table 21 and Table 23)

Tule Lake NWR

Alternative B

Under Alternative B, implementation of management activities in the Tule Lake NWR could result in:

- a short-term increase in refuge spending and local economic activity due to construction or modification of facilities (Table 15);
- a minor increase in overall refuge operations spending and related local economic impacts due to increased staffing (Table 15);
- a moderate increase in visitation, visitor spending, and local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation; and
- a decrease in agricultural production and related local economic activity compared to Alternative A (Table 20 and Table 22) due to 1,250 acre increase in standing (unharvested) grain.

Alternative C

Under Alternative C, implementation of management activities in the Tule Lake NWR could result in:

- a short-term increase in refuge spending and local economic activity due to construction or modification of facilities (Table 15);
- a minor increase in overall refuge operations spending and related local economic impacts due to increased staffing (Table 15);
- a moderate increase in visitation, visitor spending, and local economic impacts compared to Alternative A (Table 18 and Table 19) due to improved recreation;
- a decrease in agricultural production and related local economic activity compared to Alternative A (Table 20 and Table 22) due to 1,250 acre increase in standing (unharvested) grain.
- Possible greater production of more valuable organic crops.

Upper Klamath NWR

Alternative B

Under Alternative B, implementation of management activities in the Upper Klamath NWR could result in:

- a short-term, one-time increase in refuge spending and local economic activity due to construction of facilities (Table 17);
- little to no net change in overall refuge operations spending, thereby resulting in operations spending levels and related local economic impacts that would be similar to those for Alternative A (Table 17);

- a moderate increase in visitation and visitor spending due to improved recreation opportunities, resulting in a moderate increase in local economic impacts compared to Alternative A (Table 18 and Table 19); and
- no agricultural production effects.

Bear Valley NWR

Alternative B

Under Alternative B, implementation of management activities in the Bear Valley NWR could result in:

- a short-term increase in refuge spending and local economic activity due to construction of public access facilities (Table 16);
- little to no net change in overall refuge operations spending, thereby resulting in operations spending levels and related local economic impacts that would be similar to those for Alternative A (Table 16);
- a moderate increase in visitation and visitor spending due to improved recreation opportunities, resulting in a moderate increase in local economic impacts compared to Alternative A (Table 18 and Table 19); and
- no agricultural production effects. (note: no agricultural production occurs at this refuge).

Detailed Impact Tables

Budget Expenditures

Table 13: Economic Benefits of Lower Klamath NWR Budget Expenditures: All Alternatives and Changes

Category	Lower Klamath NWR Alt A ^a	Lower Klamath NWR Alt B ^a	Lower Klamath NWR Alt B Change	Lower Klamath NWR Alt C ^a	Lower Klamath NWR Alt C Change	Lower Klamath NWR Alt D ^a	Lower Klamath NWR Alt D Change
Salary Expenditures	\$1,364,508	\$1,450,764	\$86,256	\$1,450,764	\$86,256	\$1,450,764	\$86,256
Salary Expenditures Less Benefits (used for calculations)	\$955,156	\$1,015,535	\$60,379	\$1,015,535	\$60,379	\$1,015,535	\$60,379
Output	\$1,953,976	\$2,077,494	\$123,518	\$2,077,494	\$123,518	\$2,077,494	\$123,518
Employment Compensation	\$976,988	\$1,038,747	\$61,759	\$1,038,747	\$61,759	\$1,038,747	\$61,759
Jobs	13.6	14.5	0.9	14.5	0.9	14.5	0.9
All Other Expenditures^b	\$404,461	\$454,461	\$50,000	\$454,461	\$50,000	\$15,500,000	\$15,095,539
Output	\$410,303	\$461,025	\$50,722	\$461,025	\$50,722	\$15,723,872	\$15,313,568
Employment Compensation	\$102,839	\$115,553	\$12,713	\$115,553	\$12,713	\$3,941,073	\$3,838,234
Jobs	4.0	4.4	0.5	4.4	0.5	151.6	147.6
Total Budget	\$1,768,970	\$1,905,225	\$136,255	\$1,905,225	\$136,255	\$16,950,764	\$15,181,794
Output	\$2,364,279	\$2,538,519	\$174,240	\$2,538,519	\$174,240	\$17,801,366	\$15,437,087
Employment Compensation	\$1,079,828	\$1,154,300	\$74,472	\$1,154,300	\$74,472	\$4,979,820	\$3,899,993
Jobs	17.6	19.0	1.4	19.0	1.4	166.1	148.5

Notes:

^aFor all water delivery schedules.

^b65% of All Other Expenditures are local and used for the IMPLAN runs.

Table 14: Economic Benefits of Clear Lake NWR Budget Expenditures: All Alternatives and Changes

Category	Clear Lake NWR	Clear Lake NWR Alt B	Clear Lake NWR Alt B Change
Salary Expenditures	\$303,224	\$314,399	\$11,175
Salary Expenditures Less Benefits (used for calculations)	\$212,257	\$220,079	\$7,822
Output	\$303,951.84	\$315,153.46	\$11,202
Employment Compensation	\$151,975.92	\$157,576.73	\$5,601
Jobs	2.1	2.2	0.1
All Other Expenditures^a	\$89,880	\$139,880	\$50,000
Output	\$91,178.49	\$141,900.33	\$50,721.84
Employment Compensation	\$22,853.22	\$35,566.28	\$12,713.06
Jobs	0.9	1.4	0.5
Total Budget	\$393,104	\$454,279	\$61,174
Output	\$395,130.33	\$457,053.79	\$61,923
Employment Compensation	\$174,829.14	\$193,143.01	\$18,314
Jobs	3.0	3.6	0.6

Notes:

^a65% of All Other Expenditures are local and used for the IMPLAN runs.

Table 15: Economic Benefits of Tule Lake NWR Budget Expenditures: All Alternatives and Changes

Category	Tule Lake NWR	Tule Lake NWR Alt B	Tule Lake NWR Alt B Change	Tule Lake NWR Alt C	Tule Lake NWR Alt C Change
Salary Expenditures	\$1,061,284	\$1,108,389	\$47,105	\$1,136,365	\$75,081
Salary Expenditures Less Benefits (used for calculations)	\$742,899	\$776,426	\$33,527	\$797,943	\$55,044
Output	\$1,519,759.12	\$1,587,213.33	\$67,454	\$1,627,275.11	\$107,516
Employment Compensation	\$759,879.56	\$793,606.67	\$33,727	\$813,637.55	\$53,758
Jobs	10.6	11.1	0.5	11.4	0.8
All Other Expenditures^a	\$314,581	\$389,581	\$75,000	\$389,581	\$75,000
Output	\$319,124.72	\$395,207.97	\$76,083	\$395,207.97	\$76,083
Employment Compensation	\$79,986.27	\$99,055.98	\$19,070	\$99,055.98	\$19,070
Jobs	3.1	3.8	0.7	3.8	0.7
Total Budget	\$1,375,865	\$1,497,970	\$122,105	\$1,525,946	\$150,081
Output	\$1,838,883.84	\$1,982,421.30	\$143,537	\$2,022,483.08	\$183,599
Employment Compensation	\$839,865.83	\$892,662.65	\$52,797	\$912,693.54	\$72,828
Jobs	13.7	14.9	1.2	15.2	1.5

Notes:

^a65% of All Other Expenditures are local and used for the IMPLAN runs.

Table 16: Economic Benefits of Bear Valley NWR Budget Expenditures: All Alternatives and Changes

Category	Bear Valley NWR	Bear Valley NWR Alt B	Bear Valley NWR Alt B Change
Salary Expenditures	\$151,612	\$161,196	\$9,584
Salary Expenditures Less Benefits (used for calculations)	\$106,128	\$113,114	\$6,985
Output	\$217,108	\$230,833	\$13,724
Employment Compensation	\$108,554	\$115,416	\$6,862
Jobs	1.5	1.6	0.1
All Other Expenditures^a	\$44,940	\$144,940	\$100,000
Output	\$45,589	\$147,033	\$101,444
Employment Compensation	\$11,427	\$36,853	\$25,426
Jobs	0.4	1.4	1.0
Total Budget	\$196,552	\$306,136	\$109,584
Output	\$262,698	\$377,866	\$115,168
Employment Compensation	\$119,981	\$152,269	\$32,288
Jobs	2.0	3.0	1.1

Notes:

^a65% of All Other Expenditures are local and used for the IMPLAN runs.

Table 17: Economic Benefits of Upper Klamath NWR Budget Expenditures: All Alternatives and Changes

Category	Upper Klamath NWR	Upper Klamath NWR Alt B	Upper Klamath NWR Alt B Change
Salary Expenditures	\$160,138	\$169,722	\$9,584
Salary Expenditures Less Benefits (used for calculations)	\$112,097	\$119,082	\$6,985
Output	\$229,318	\$243,042	\$13,724
Employment Compensation	\$114,659	\$121,521	\$6,862
Jobs	1.6	1.7	0.1
All Other Expenditures^a	\$44,940	\$94,940	\$50,000
Output	\$45,589	\$96,311	\$50,722
Employment Compensation	\$11,427	\$24,140	\$12,713
Jobs	0.4	0.9	0.5
Total Budget	\$205,078	\$264,662	\$59,584
Output	\$274,907	\$339,353	\$64,446
Employment Compensation	\$126,085	\$145,661	\$19,575
Jobs	2.0	2.6	0.6

Notes:

^a65% of All Other Expenditures are local and used for the IMPLAN runs.

Recreation Visitation

Table 18. Summary of Recreation by Refuge and Alternative: Visitation Data

Area Alternative, Recreation Category	Local Residents (Visits per year)	Non-Local Residents (Visits per year)	Total (Visits per year)	Average Recreation Time (hours per visit)	Visitor Hours	Visitor Days
Bear Valley Alt A, Hunting	245	35	280	10	2,800	350
Bear Valley Alt A, Non-Consumptive	0	0	0	0	0	0
Bear Valley Alt B, Hunting	245	70	315	10	3,150	394
Bear Valley Alt B, Non-Consumptive	175	475	650	4	2,375	297
Clear Lake Alt A, Hunting	25	50	75	10	750	94
Clear Lake Alt A, Non-Consumptive	0	0	0	0	0	0
Clear Lake Alt B, Hunting	25	50	75	10	750	94
Clear Lake Alt B, Non-Consumptive	200	200	400	4	1,600	200
Lower Klamath Alt A (.2), Hunting	3,500	4,500	8,000	5	40,000	5,000
Lower Klamath Alt A (.2), Non-Consumptive	11,150	16,150	27,300	3	94,200	11,775
Lower Klamath Alt A (.8), Hunting	5,500	6,500	12,000	5	60,000	7,500
Lower Klamath Alt A (.8), Non-Consumptive	13,650	18,650	32,300	4	129,200	16,150
Lower Klamath Alt A (KBRA), Hunting	7,500	8,500	16,000	5	80,000	10,000
Lower Klamath Alt A (KBRA), Non-Consumptive	14,650	21,150	35,800	4	143,200	17,900
Lower Klamath Alt B (.2), Hunting	3,900	4,900	8,800	5	44,000	5,500
Lower Klamath Alt B (.2), Non-Consumptive	15,840	20,840	36,680	5	169,080	21,135
Lower Klamath Alt B (.8), Hunting	5,900	6,900	12,800	5	64,000	8,000
Lower Klamath Alt B (.8), Non-Consumptive	18,340	23,340	41,680	5	206,080	25,760
Lower Klamath Alt B (KBRA), Hunting	7,900	8,900	16,800	5	84,000	10,500
Lower Klamath Alt B (KBRA), Non-Consumptive	19,340	25,840	45,180	5	220,080	27,510
Lower Klamath Alt C (.2), Hunting	3,900	4,900	8,800	5	44,000	5,500
Lower Klamath Alt C (.2), Non-Consumptive	15,840	20,840	36,680	5	169,080	21,135
Lower Klamath Alt C (.8), Hunting	5,900	6,900	12,800	5	64,000	8,000
Lower Klamath Alt C (.8), Non-Consumptive	18,340	23,340	41,680	5	206,080	25,760
Lower Klamath Alt C (KBRA), Hunting	7,900	8,900	16,800	5	84,000	10,500
Lower Klamath Alt C (KBRA), Non-Consumptive	19,340	25,840	45,180	5	220,080	27,510
Lower Klamath Alt D (.2), Hunting	3,400	4,400	7,800	5	39,000	4,875
Lower Klamath Alt D (.2), Non-Consumptive	15,840	20,840	36,680	5	169,080	21,135
Lower Klamath Alt D (.8), Hunting	5,400	6,400	11,800	5	59,000	7,375
Lower Klamath Alt D (.8), Non-Consumptive	18,340	23,340	41,680	5	206,080	25,760
Lower Klamath Alt D (KBRA), Hunting	7,400	8,400	15,800	5	79,000	9,875
Lower Klamath Alt D (KBRA), Non-Consumptive	19,340	25,840	45,180	5	220,080	27,510
Tule Lake Alt A, Hunting	6,250	7,500	13,750	12	165,000	20,625
Tule Lake Alt A, Non-Consumptive	16,150	24,150	40,300	5	201,500	25,188
Tule Lake Alt B, Hunting	6,750	8,100	14,800	12	177,600	22,200
Tule Lake Alt B, Non-Consumptive	19,840	27,840	47,680	6	305,760	38,220
Tule Lake Alt C, Hunting	6,750	8,100	14,800	12	177,600	22,200
Tule Lake Alt C, Non-Consumptive	19,840	27,840	47,680	6	305,760	38,220
Upper Klamath Alt A, Fishing	3,000	2,000	5,000	10	50,000	6,250
Upper Klamath Alt A, Hunting	1,000	3,000	4,000	12	48,000	6,000
Upper Klamath Alt A, Non-Consumptive	2,000	8,000	10,000	5	50,000	6,250
Upper Klamath Alt B, Fishing	3,000	2,000	5,000	10	50,000	6,250
Upper Klamath Alt B, Hunting	1,000	3,000	4,000	12	48,000	6,000
Upper Klamath Alt B, Non-Consumptive	2,700	10,800	13,500	6	81,000	10,125

Table 19. Summary of Recreation by Refuge and Alternative: Expenditures and Economic Impacts

Area Alternative, Recreation Category	Recreation Expenditures (1,000 2015 Dollars)		Local Residents Expenditure Multiplier			Non-Local Residents Expenditure Multiplier			Local and Non-Local Residents Economic Effect		
	Residents	Non-Residents	Output	Employment Compensation	Jobs (Per Million Expenditures)	Output	Employment Compensation	Jobs (Per Million Expenditures)	Output (\$1,000 2015)	Employment Compensation (\$1,000 2015)	Total Jobs
Bear Valley Alt A	35	4	1.54	0.32	11.83	1.51	0.30	-	60	12	-
Bear Valley Alt B	39	44	1.54	0.32	11.83	1.51	0.30	-	127	26	-
Clear Lake Alt A	4	6	1.58	0.35	15.51	1.53	0.32	-	15	3	-
Clear Lake Alt B	9	20	1.58	0.35	15.51	1.53	0.32	-	45	10	-
Lower Klamath Alt A (.2)	381	1,273	1.58	0.35	14.98	1.54	0.33	13.02	2,562	555	22.29
Lower Klamath Alt A (.8)	543	1,764	1.58	0.35	14.98	1.54	0.33	13.02	3,575	775	31.12
Lower Klamath Alt A (KBRA)	625	2,082	1.58	0.35	14.98	1.54	0.33	13.02	4,194	909	36.49
Lower Klamath Alt B (.2)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt B (.8)	834	2,461	1.58	0.35	14.98	1.54	0.33	13.02	5,108	1,107	44.55
Lower Klamath Alt B (KBRA)	916	2,779	1.58	0.35	14.98	1.54	0.33	13.02	5,726	1,241	49.92
Lower Klamath Alt C (.2)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt C (.8)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt C (KBRA)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt D (.2)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt D (.8)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Lower Klamath Alt D (KBRA)	759	2,191	1.58	0.35	14.98	1.54	0.33	13.02	4,572	991	39.90
Tule Lake Alt A	853	2,962	1.57	0.35	15.14	1.54	0.33	13.50	5,916	1,283	52.90
Tule Lake Alt B	1,009	3,352	1.57	0.35	15.14	1.54	0.33	13.50	6,762	1,466	60.52
Tule Lake Alt C	1,009	3,352	1.57	0.35	15.14	1.54	0.33	13.50	6,762	1,466	60.52
Upper Klamath Alt A	337	1,383	1.59	0.36	15.60	1.55	0.33	13.60	2,675	581	24.07
Upper Klamath Alt B	362	1,627	1.59	0.36	15.60	1.55	0.33	13.60	3,091	671	27.78

Agricultural Production

Table 20: Crop Production Acres and Sales: All Alternatives and Changes

Area & Scenario	Acres Total Grain (sold)	Sales Grain	Row Crops	Sales Row Crops	Alfalfa	Sales Alfalfa	Haying	Sales Haying	Total Acres in Production for Sales	Total Sales
Lower Klamath NWR - Alt A (.2)	1,200	\$747,558	0	\$0	0	\$0	2,000	\$1,211,948	3,200	\$1,959,506
Lower Klamath NWR - Alt A (.8)	7,200	\$4,485,348	0	\$0	0	\$0	2,000	\$1,211,948	9,200	\$5,697,296
Lower Klamath NWR - Alt A KBRA (.2)	3,700	\$2,304,971	0	\$0	0	\$0	2,000	\$1,211,948	5,700	\$3,516,919
Lower Klamath NWR - Alt A KBRA (.8)	7,200	\$4,485,348	0	\$0	0	\$0	2,000	\$1,211,948	9,200	\$5,697,296
Lower Klamath NWR - Alt B (.2)	1,050	\$654,113	0	\$0	0	\$0	2,000	\$1,211,948	3,050	\$1,866,061
Change Alt B (.2)	-150	-\$93,445	0	\$0	0	\$0	0	\$0	-150	-\$93,445
Lower Klamath NWR - Alt B (.8)	3,350	\$2,086,933	0	\$0	0	\$0	2,000	\$1,211,948	5,350	\$3,298,881
Change Alt B (.8)	-3,850	-\$2,398,415	0	\$0	0	\$0	0	\$0	-3,850	-\$2,398,415
Lower Klamath NWR - Alt B KBRA (.2)	2,850	\$1,775,450	0	\$0	0	\$0	2,000	\$1,211,948	4,850	\$2,987,398
Change Alt B KBRA (.2)	-850	-\$529,520	0	\$0	0	\$0	0	\$0	-850	-\$529,520
Lower Klamath NWR - Alt B KBRA (.8)	4,950	\$3,083,677	0	\$0	0	\$0	2,000	\$1,211,948	6,950	\$4,295,625
Change Alt B KBRA (.8)	-2,250	-\$1,401,671	0	\$0	0	\$0	0	\$0	-2,250	-\$1,401,671
Lower Klamath NWR - Alt C (.2)	1,250	\$778,706	0	\$0	0	\$0	2,000	\$1,211,948	3,250	\$1,990,654
Change Alt C (.2)	50	\$31,148	0	\$0	0	\$0	0	\$0	50	\$31,148
Lower Klamath NWR - Alt C (.8)	5,250	\$3,270,566	0	\$0	0	\$0	2,000	\$1,211,948	7,250	\$4,482,514
Change Alt C (.8)	-1,950	-\$1,214,782	0	\$0	0	\$0	0	\$0	-1,950	-\$1,214,782
Lower Klamath NWR - Alt C KBRA (.2)	2,850	\$1,775,450	0	\$0	0	\$0	2,000	\$1,211,948	4,850	\$2,987,398
Change Alt C KBRA (.2)	-850	-\$529,520	0	\$0	0	\$0	0	\$0	-850	-\$529,520
Lower Klamath NWR - Alt C KBRA (.8)	4,950	\$3,083,677	0	\$0	0	\$0	2,000	\$1,211,948	6,950	\$4,295,625
Change Alt C KBRA (.8)	-2,250	-\$1,401,671	0	\$0	0	\$0	0	\$0	-2,250	-\$1,401,671
Lower Klamath NWR - Alt D (.2)	1,250	\$778,706	0	\$0	0	\$0	2,000	\$1,211,948	3,250	\$1,990,654
Change Alt D (.2)	50	\$31,148	0	\$0	0	\$0	0	\$0	50	\$31,148
Lower Klamath NWR - Alt D (.8)	5,250	\$3,270,566	0	\$0	0	\$0	2,000	\$1,211,948	7,250	\$4,482,514
Change Alt D (.8)	-1,950	-\$1,214,782	0	\$0	0	\$0	0	\$0	-1,950	-\$1,214,782
Lower Klamath NWR - Alt D KBRA (.2)	3,150	\$1,962,340	0	\$0	0	\$0	2,000	\$1,211,948	5,150	\$3,174,288
Change Alt D KBRA (.2)	-550	-\$342,631	0	\$0	0	\$0	0	\$0	-550	-\$342,631
Lower Klamath NWR - Alt D KBRA (.8)	5,250	\$3,270,566	0	\$0	0	\$0	2,000	\$1,211,948	7,250	\$4,482,514
Change Alt D KBRA (.8)	-1,950	-\$1,214,782	0	\$0	0	\$0	0	\$0	-1,950	-\$1,214,782
Tule Lake NWR- Alt A	10,990	\$6,846,136	6,374	\$25,515,377	1,936	\$1,888,827	0	\$0	19,300	\$34,250,340
Tule Lake NWR- Alt B & C	9,201	\$5,731,901	5,994	\$23,994,222	3,400	\$3,317,154	0	\$0	18,595	\$33,043,277
Change Alt B & C	-1,789	-\$1,114,235	-380	-\$1,521,155	1,464	\$1,428,328	0	\$0	-705	-\$1,207,063
Upper Klamath NWR - Alt A	0	\$0	0	\$0	0	\$0	200	\$121,195	200	\$121,195
Upper Klamath NWR - Alt B	0	\$0	0	\$0	0	\$0	200	\$121,195	200	\$121,195
Change Alt B	0	\$0	0	\$0	0	\$0	0	\$0	0	\$0

Table 21: Cattle Production Acres, Cows, and Sales: All Alternatives and Changes

Unit (Scenario)	Acres	Cows Per Acre	Cows	Sale Price per Cow	Average Sales per Acre	Sales ^a
Lower Klamath NWR ^b	12,500	0.32	4,000	\$1,095	\$350	\$4,380,000
Lower Klamath NWR Alt C & D ^b	15,500	0.32	4,960	\$1,095	\$350	\$5,431,200
<i>Change Alt C & D</i>	3,000	-	960	-	-	\$1,051,200
Upper Klamath NWR (Low)	1,400	0.4	560	\$1,095	\$438	\$613,200
Upper Klamath NWR (High)	2,200	0.25	560 ^a	\$1,095	\$278.73	\$613,200
Clear Lake NWR	5,000	0.11	550	\$1,095	\$120	\$602,250
Clear Lake NWR B	8,000	0.11	880	\$1,095	\$120	\$963,600
<i>Change Alt B</i>	3,000	-	330		-	\$361,350

Notes:

^aAUMs in Upper Klamath NWR are not variable. The number of acres the cows can occupy is.

^bFor all water delivery schedules.

Table 22: Economic Impacts of Crop Production: All Alternatives and Changes

Area & Scenario	Grain Output	Grain Employment Compensation	Grain Jobs	Row Crops Output	Row Crops Employment Compensation	Row Crops Jobs	Hay & Alfalfa Output	Hay & Alfalfa Employment Compensation	Hay & Alfalfa Jobs	Total Output	Total Employment Compensation	Total Jobs
Lower Klamath NWR - Alt A (.2)	\$1,320,249	\$177,490	7.0	\$0	\$0	0.0	\$2,140,400	\$177,490	7.0	\$3,460,648	\$354,981	14.0
Lower Klamath NWR - Alt A (.8)	\$7,921,492	\$1,064,942	42.0	\$0	\$0	0.0	\$2,140,400	\$1,064,942	42.0	\$10,061,892	\$2,129,885	83.9
Lower Klamath NWR - Alt A KBRA (.2)	\$4,070,767	\$547,262	21.6	\$0	\$0	0.0	\$2,140,400	\$547,262	21.6	\$6,211,166	\$1,094,524	43.1
Lower Klamath NWR - Alt A KBRA (.8)	\$7,921,492	\$1,064,942	42.0	\$0	\$0	0.0	\$2,140,400	\$1,064,942	42.0	\$10,061,892	\$2,129,885	83.9
Lower Klamath NWR - Alt B (.2)	\$1,155,218	\$155,304	6.1	\$0	\$0	0.0	\$2,140,400	\$155,304	6.1	\$3,295,617	\$310,608	12.2
Change Alt B (.2)	-\$165,031	-\$22,186	-0.9	\$0	\$0	0.0	\$0	-\$22,186	-0.9	-\$165,031	-\$44,373	-1.7
Lower Klamath NWR - Alt B (.8)	\$3,685,694	\$495,494	19.5	\$0	\$0	0.0	\$2,140,400	\$495,494	19.5	\$5,826,094	\$990,988	39.1
Change Alt B (.8)	-\$4,235,798	-\$569,448	-22.4	\$0	\$0	0.0	\$0	-\$569,448	-22.4	-\$4,235,798	-\$1,138,897	-44.9
Lower Klamath NWR - Alt B KBRA (.2)	\$3,135,591	\$421,540	16.6	\$0	\$0	0.0	\$2,140,400	\$421,540	16.6	\$5,275,990	\$843,079	33.2
Change Alt B KBRA (.2)	-\$935,176	-\$125,722	-5.0	\$0	\$0	0.0	\$0	-\$125,722	-5.0	-\$935,176	-\$251,445	-9.9
Lower Klamath NWR - Alt B KBRA (.8)	\$5,446,026	\$732,148	28.9	\$0	\$0	0.0	\$2,140,400	\$732,148	28.9	\$7,586,425	\$1,464,296	57.7
Change Alt B KBRA (.8)	-\$2,475,466	-\$332,794	-13.1	\$0	\$0	0.0	\$0	-\$332,794	-13.1	-\$2,475,466	-\$665,589	-26.2
Lower Klamath NWR - Alt C (.2)	\$1,375,259	\$184,886	7.3	\$0	\$0	0.0	\$2,140,400	\$184,886	7.3	\$3,515,659	\$369,772	14.6
Change Alt C (.2)	\$55,010	\$7,395	0.3	\$0	\$0	0.0	\$0	\$7,395	0.3	\$55,010	\$14,791	0.6
Lower Klamath NWR - Alt C (.8)	\$5,776,088	\$776,520	30.6	\$0	\$0	0.0	\$2,140,400	\$776,520	30.6	\$7,916,488	\$1,553,041	61.2
Change Alt C (.8)	-\$2,145,404	-\$288,422	-11.4	\$0	\$0	0.0	\$0	-\$288,422	-11.4	-\$2,145,404	-\$576,844	-22.7
Lower Klamath NWR - Alt C KBRA (.2)	\$3,135,591	\$421,540	16.6	\$0	\$0	0.0	\$2,140,400	\$421,540	16.6	\$5,275,990	\$843,079	33.2
Change Alt C KBRA (.2)	-\$935,176	-\$125,722	-5.0	\$0	\$0	0.0	\$0	-\$125,722	-5.0	-\$935,176	-\$251,445	-9.9
Lower Klamath NWR - Alt C KBRA (.8)	\$5,446,026	\$732,148	28.9	\$0	\$0	0.0	\$2,140,400	\$732,148	28.9	\$7,586,425	\$1,464,296	57.7
Change Alt C KBRA (.8)	-\$2,475,466	-\$332,794	-13.1	\$0	\$0	0.0	\$0	-\$332,794	-13.1	-\$2,475,466	-\$665,589	-26.2
Lower Klamath NWR - Alt D (.2)	\$1,375,259	\$184,886	7.3	\$0	\$0	0.0	\$2,140,400	\$184,886	7.3	\$3,515,659	\$369,772	14.6
Change Alt D (.2)	\$55,010	\$7,395	0.3	\$0	\$0	0.0	\$0	\$7,395	0.3	\$55,010	\$14,791	0.6
Lower Klamath NWR - Alt D (.8)	\$5,776,088	\$776,520	30.6	\$0	\$0	0.0	\$2,140,400	\$776,520	30.6	\$7,916,488	\$1,553,041	61.2
Change Alt D (.8)	-\$2,145,404	-\$288,422	-11.4	\$0	\$0	0.0	\$0	-\$288,422	-11.4	-\$2,145,404	-\$576,844	-22.7
Lower Klamath NWR - Alt D KBRA (.2)	\$3,465,653	\$465,912	18.4	\$0	\$0	0.0	\$2,140,400	\$465,912	18.4	\$5,606,052	\$931,824	36.7
Change Alt D KBRA (.2)	-\$605,114	-\$81,350	-3.2	\$0	\$0	0.0	\$0	-\$81,350	-3.2	-\$605,114	-\$162,700	-6.4
Lower Klamath NWR - Alt D KBRA (.8)	\$5,776,088	\$776,520	30.6	\$0	\$0	0.0	\$2,140,400	\$776,520	30.6	\$7,916,488	\$1,553,041	61.2
Change Alt D KBRA (.8)	-\$2,145,404	-\$288,422	-11.4	\$0	\$0	0.0	\$0	-\$288,422	-11.4	-\$2,145,404	-\$576,844	-22.7
Tule Lake NWR- Alt A	\$12,090,837	\$1,625,457	64.1	\$40,808,837	\$9,118,266	446.7	\$3,335,822	\$1,625,457	64.1	\$56,235,496	\$12,369,179	574.8
Tule Lake NWR- Alt B & Alt C	\$10,123,006	\$1,360,907	53.6	\$38,375,928	\$8,574,660	420.1	\$5,858,366	\$1,360,907	53.6	\$54,357,300	\$11,296,475	527.3
Change Alt B & C	-\$1,967,831	-\$264,549	-10.4	-\$2,432,908	-\$543,605	-26.6	\$2,522,543	-\$264,549	-10.4	-\$1,878,196	-\$1,072,704	-47.5
Upper Klamath NWR - Alt A	\$0	\$0	0.0	\$0	\$0	0.0	\$214,040	\$0	0.0	\$214,040	\$0	0.0
Upper Klamath NWR - Alt B	\$0	\$0	0.0	\$0	\$0	0.0	\$214,040	\$0	0.0	\$214,040	\$0	0.0
Change Alt B	\$0	\$0	0.0	\$0	\$0	0.0	\$0	\$0	0.0	\$0	\$0	0.0

Source: IMPLAN input-output model run results.

Table 23: Economic Impacts of Cattle Production: All Alternatives and Changes

Area (Alternative & Scenario)	Sales	Output	Employment Compensation	Jobs
Lower Klamath NWR ^a	\$4,380,000	\$7,269,804	\$606,949	36.2
Lower Klamath NWR Alt C & D ^a	\$5,431,200	\$9,014,556	\$752,617	44.9
<i>Change Alt C & D</i>	\$1,051,200	\$1,744,753	\$145,668	8.7
Upper Klamath NWR (Low)	\$613,200	\$1,017,772	\$84,973	5.1
Upper Klamath NWR (High)	\$613,200	\$1,017,772	\$84,973	5.1
Clear Lake NWR	\$602,250	\$999,598	\$83,456	5.0
Clear Lake NWR B	\$963,600	\$1,599,357	\$133,529	8.0
<i>Change Alt B</i>	\$361,350	\$599,759	\$50,073	3.0

Notes:

^aFor all water delivery schedules.

In Table 24 possible changes in Kuchel Act Payments in Lieu of Taxes (PILT) and payments to Tule Lake Irrigation District are explored. Due to the complex and uncertain nature of commodity prices and leasing expenses the data from 2015 is used for the possible impacts. Payments to TID and to counties are estimated based on the average payment per acre farmed in 2015. This is meant to give an approximation and not a precise estimate of impacts. The example only covers Tule Lake Refuge due to it representing 89 to 96 of the value of production and it simplifies the example. As is shown below, local transfer payments should not decrease by more than four percent.

Table 24: Payments to Counties and Tulelake Irrigation District

Item	Tule Lake NWR
Acres In Production	19,300
Kuchel Act Payment to Counties 2015	\$502,200
Kuchel PILT Per Acre 2015	\$26.0
Tulelake Irrigation District (TID) Payment 2015	\$494,700
TID payment Per Acre 2015	\$25.60
Alternative B or C Acreage Decrease ^a	705
Possible Decrease in PILT Annually	\$18,300
Possible Decrease in TID Payments Annually	\$18,100

Note: ^a. The reduction in planted acreage due to increase of 380 average acreage of walking wetlands and reduction in harvested acres due to increase in standing grain of 1,500 acres (325 acres annually productivity decrease).

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